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subjects as the gamma functions, elliptic integrals, line, surface and space integrals, and his knowledge of the applications of the definite integral should be considerably extended. It has been my custom to found the integral part of this course on Volume 2 of Byerly's *Calculus*, and to make liberal references to other works for both theory and application.

For the last three hours I find it difficult to decide on a subject. There are many subjects entirely suitable that would add variety to the somewhat restricted schedule given above. In many ways a course in analytic mechanics would be ideal at this time. However, keeping the graduate school in mind as the goal toward which the student is working, and recalling Dr. Bolza's rather insistent claim that a student should have two years of calculus for admission to graduate work, I venture to suggest a course in differential equations.

Differential Equations. This can be made as difficult as the ability of the class will permit, and furnishes a splendid review in the processes of integration. No outline of this need be suggested, for it will of necessity be kept quite elementary. However it should be given as many points of contact with other subjects as time will permit.

This schedule, three hours of algebra, three hours of geometry, and six hours of calculus, will probably seem to lack variety. I have kept the graduate school in mind and to the best of my ability selected subjects accordingly. For those students whose school career must stop with the bachelor's degree, or who pursue other lines of study later, a different selection may be advisable.

Conclusion. While it is not directly pertinent to the question, I venture to suggest that some students enter college prepared to begin analytic geometry, and are thus in line for eighteen hours instead of twelve. This is by no means uncommon in the college with which I am connected, owing to the good work of the mathematics department of the Topeka high school. Others will frequently desire to carry two courses simultaneously. Hence there is considerable opportunity to introduce variety where the teaching force will permit. Also a number of two hour courses can be offered, considerably widening the scope of the above schedule. In this way such subjects as history of mathematics, theory of determinants, geometry of position, geometry of three dimensions, and many others may be introduced, and the student given a much wider view without subtracting from his foundation work.

NOTES AND NEWS.

The problem department of SCHOOL SCIENCE AND MATHEMATICS is now in charge of DR. J. O. HASSLER, of the Englewood High School, Chicago.

MR. CARL GARLOUGH has been appointed to an instructorship in mathematics in Wheaton College, Wheaton, Ill.

PROFESSOR FLORIAN CAJORI has an interesting article in *Bibliotheca Mathematica* for May, 1915, on "An integration antedating the integral calculus."

DR. U. G. MITCHELL gave an address recently before the teachers of Marion county, Kansas, on "A new point of view for text-books and teachers."

The American Mathematical Society met in regular session at Columbia University, New York City, on October thirtieth; the southwestern section met at Washington University, St. Louis, on November twenty-seventh.

"Number and the quadratic" is the title of a paper by PROFESSOR RICHARD MORRIS, of Rutgers College, appearing in the November number of *School Science and Mathematics*.

"The need of supervision in college teaching" is the title of an article in *School and Society* for October 9, 1915, which is worthy of consideration by all college teachers, not least by teachers of mathematics.

The University of Washington Publications in mathematical and physical sciences have been inaugurated with an extensive presentation of "An arithmetical theory of certain numerical functions" by ERIC T. BELL.

In *Science* for July 23 PROFESSOR W. H. ROEVER gives a comparative and critical *résumé* of the treatments of the meridional deviation of a falling body by himself, by PROFESSOR F. R. Moulton, and by DR. R. S. Woodward, already noted in early numbers of the MONTHLY.

An inquiry made several years ago in *L'Intermédiaire* by MR. E. B. ESCOTT for a complete study of the equation $aX^4 + bY^4 = cZ^2$ brought forth a very extended article by A. GÉRARDIN in the July number of that journal, in which he solves the problem by three different methods and supplements this by a bibliography.

PROFESSOR G. A. MILLER writes on "A few classic unknowns in mathematics" in the October number of *The Scientific Monthly*. In this article he lists several well known questions in the theory of numbers which are as yet unsolved but the nature of which can be understood even by persons quite limited in their knowledge of mathematics.

FRANKLIN, MACNUTT and CHARLES have published a "supplement" which is to take the place of the first forty-one pages of the 1913 edition of their text in calculus. The principal change consists in giving a more rigorous introduction for the derivative and differential notation. A list of corrections to the earlier edition is also given.

DR. G. J. KOLLEN, president emeritus of Hope College, Holland, Michigan, died on September 5. For fifty years he had been in educational work, being at various times professor of mathematics, natural philosophy and applied mathematics. He was a graduate of Hope College, and held the honorary degree of doctor of laws from Rutgers College.

"The Human Significance of Mathematics" is the title of an address given by PROFESSOR C. J. KEYSER at Berkeley, Calif., August 3, 1915, at a joint meeting of the American Mathematical Society, the American Astronomical Society, and Section A of the American Association for the Advancement of Science. The address is printed in *Science* for November 22, 1915. It is well worth the attention of every teacher of mathematics.

The Macmillan Company announces the publication of a manual of "Constructive Geometry" by PROFESSOR E. R. HEDRICK, a "Grammar School Arithmetic" by PROFESSOR F. CAJORI, and an "Elementary Algebra" by PROFESSOR CAJORI and LETITIA R. ODELL, the latter of the North Side High School of Denver.

In the October number of the *School Review* MR. RALEIGH SCHORLING, of the University of Chicago High School, reports the results of a survey made for the purpose of investigating the general problem of individual differences in the teaching of secondary school mathematics, as treated in the various institutions which offer practice-teaching courses. The article concerns more particularly the methods for dealing with the slower students.

The March–April number of *Rendiconti del Circolo Matematico di Palermo* contains an unusually large proportion of articles by Americans. These are "Aggregates of minors of persymmetric determinants" by PROFESSOR W. H. METZLER and L. H. RICE, "A certain class of transcendental curves" by DR. FLORENCE E. ALLEN, "Conjugate systems with equal tangential invariants and the transformation of Moutard" by PROFESSOR L. P. EISENHART, and a "Note on trigonometric interpolation" by DR. DUNHAM JACKSON.

Upon the invitation of the American Society of Mechanical Engineers, a joint committee representing seventeen scientific societies, including the American Mathematical Society, has been working on the question of "Standards for graphic representation." A brief preliminary report has been published for the purpose of soliciting criticisms and suggestions. Copies may be obtained from the American Society of Mechanical Engineers, 29 West 39th St., New York City. The price is ten cents. The representative of the American Mathematical Society is PROFESSOR H. E. HAWKES, of Columbia University.

The Carnegie Endowment for International Peace has just issued a pamphlet entitled "Problems about war for classes in arithmetic." This was prepared by Professor DAVID EUGENE SMITH, and will be sent to any teacher who requests a copy. Letters should be sent to the Endowment, 407 West 117th Street, New York City. The purpose of the pamphlet is to bring before pupils at an impressionable age some idea of their responsibility for a wiser use of money on the part of the whole world than that which looks for a model to the present vast expenditures for armaments.

At Rutgers College a Mathematical Club has been formed among the undergraduates, and during the past year the following papers were presented: "The cubic and the quartic," MR. EDWIN FLORANCE; "The fundamental theorem of algebra," MR. LOUIS B. GITTLEMAN; "Elementary theorems on the roots of an equation," MR. J. H. HUNTINGTON; "The fourth dimension," MR. JAMES B. SCARR; "The elements of life insurance," PROFESSOR STANLEY E. BRASEFIELD; "Arithmetical processes and the number field," DR. RICHARD MORRIS; "The solution of certain trigonometric equations," MR. HAROLD I. FAWCETT; "Some trigonometric series," MR. CLIFFORD P. OSBORNE; "Trilinear coördinates," DR. JOHN A. INGHAM. The MONTHLY comes to the College library and is read by the mathematical students and others.

The fifty-third annual meeting of the Minnesota Educational Association was held at Minneapolis, October 27–30, 1915. The mathematics section of the secondary department held two sessions, at one of which MR. W. D. REEVE, the newly appointed head of the department in the University of Minnesota high school, discussed a list of helpful books and journals for teachers of mathematics. Also, at the section for college teachers of education MR. REEVE gave a paper on a methods course for training high-school teachers of mathematics. At each of these sessions, PROFESSOR H. E. SLAUGHT, being called from the floor, laid emphasis upon individual stimulus for high-school teachers above their daily routine and upon the need of some systematic attention to the preparation of college instructors in mathematics with respect to the principles of good teaching.

The *Mathematics Teacher* for September, 1915, contains an extensive report of a committee on bibliography of which EUGENE R. SMITH is chairman. The list of books given covers many things which might be of interest to a teacher of secondary mathematics and which cannot be found in the "Bibliography of the teaching of mathematics" published by the U. S. Bureau of Education as Bulletin No. 503. In particular, it contains lists of text-books and exercise books in algebra, geometry, and trigonometry; publications of state departments, and of the U. S. Bureau of Education, relating to mathematics in the secondary schools; and association reports and college publications on the teaching of algebra, geometry, and trigonometry; covering in all twenty-two closely printed pages. This bibliography should be of great service to all teachers of mathematics.

According to the annual report in *Science* for October 22, 1915, on Doctorates in American Universities, there were 23 doctorates in mathematics conferred during 1915. The average number for the past ten years is twelve per year, and the total to date is 297. The departments conferring more than ten degrees in 1915 are, in order, chemistry 85, botany 40, zoology 32, physics 31, geology 26, mathematics 23 and psychology 22. The universities conferring two or more degrees in mathematics in 1915 are, in order, Chicago 7, Harvard 3, Columbia, Cornell, Pennsylvania, and Yale each 2. Illinois, Johns Hopkins, Missouri, and Princeton each conferred one doctorate in mathematics. The total number of doctorates in the sciences for 1915 was 309 and the grand total in all branches was 556. The number conferred during the past eighteen years is 6,320.

It is altogether in line with the purposes of the MONTHLY to call attention to notable texts in higher mathematics as they appear. In this connection we may mention among the earlier numbers of the Edinburgh Mathematical Tracts, published by G. Bell and Sons, under the general editorship of PROFESSOR E. T. WHITTAKER, the following numbers: "A course in interpolation and numerical integration for the mathematical laboratory" by DAVID GIBB; "Relativity" by A. W. CONWAY; "A course in Fourier's analysis and periodogram analysis for the mathematical laboratory" by G. A. CARSE and G. SHEARER; "A course in the solution of spherical triangles for the mathematical laboratory" by H. BELL; and "An introduction to the theory of automorphic functions" by L. R. FORD. The majority of the Edinburgh Tracts were inspired by the work of the mathematical laboratory in Edinburgh and are devoted to laboratory instruction, in the belief that "the student trained in modern pure mathematics is somewhat helpless in face of the concrete problems presented by the applied mathematical sciences" unless his training is supplemented by courses in "a mathematical laboratory, devoted to numerical and graphical calculation and analysis."

The fifteenth annual meeting of the Central Association of Science and Mathematics Teachers was held in Chicago on Friday and Saturday, November 26, 27. At the opening of the general session, Professor E. R. HEDRICK, of the University of Missouri, gave an address on "Required mathematics in secondary schools and colleges"; and EDWARD A. STEINER, professor of sociology at Grinnell College, Iowa, spoke on "A message from a sociologist to teachers of science and mathematics."

The mathematics section held two sessions at which committee reports were presented: on algebra by MARY JACKSON of Lincoln High School, Nebraska; on geometry by E. R. BRESLICH of the University of Chicago High School; on correlation of secondary mathematics by EDNA ALLEN of Iowa State Teachers College; and on vocational mathematics by KENNETH G. SMITH of Iowa State Agricultural College. There were also two addresses at the section meetings; one by Professor G. W. MYERS of the University of Chicago on "Current educational movements and general mathematics," and the other by Professor L. C. KARPINSKI of the University of Michigan on "The history of algebra, with stereopticon views." There was also a round table discussion on "History of mathematics—its place and value in secondary mathematics," led by CHRISTINE BEDNAR, of Parker High School, Chicago, and followed by Professor KARPINSKI and others.

The call for an organization meeting of a new National Mathematical Association was signed by about four hundred and fifty persons representing every state in the Union, the District of Columbia, and Canada, and including high school, normal school, college, and university teachers, consulting engineers, actuaries, and others who are interested in mathematics purely for its own sake. The meeting was scheduled for Thursday, December 30, at ten o'clock A. M., in Page Hall, Ohio State University. Doubtless other sessions will be needed to complete the organization. Only one program was arranged, aside from the business sessions; namely, on Friday morning at nine o'clock, Professor L. C. Karpinski, of the University of Michigan, is to give an illustrated address on "The Story of Algebra," to which all mathematicians in attendance upon the Columbus meetings are invited. A full report of the organization of the new Association will be printed in the January issue of the MONTHLY, and a copy will be sent to all persons who signed the call and to all who request the same before the date of the meeting. Announcement of conditions of membership will be sent to all who have manifested interest in this movement, and the announcement stated that a proposition would be made at Columbus to admit to charter membership all who may join the new Association before April 1, 1916.

The MONTHLY closes its third year since its reorganization with many of its earlier fears and anxieties removed, with its subscription list more than trebled, with a large and increasing body of contributors, and with a feeling of certainty that no mistake was made in regard to the opportunity that seemed to be offered in the field in which its operations have been centered. High praise is due to those colleges and universities which deemed the cause represented by the MONTHLY to be worthy of their consideration and which made possible the promotion of this cause by their generous subsidy contributions throughout the three-year period. Hearty thanks are due the representatives of these institutions who have constituted the Board of Editors and who have unselfishly given their time and their services, amounting in the aggregate to no small consideration, thus showing their faith in this cause and their willingness to back it by works. Full credit is due the constituency of the MONTHLY, a widely representative body of persons who have shown their confidence and indicated their loyalty by their continued adherence in ever-increasing numbers. Finally, and not least, credit is due those who have made their contributions to the cause by purchasing advertising space, and to The New Era Printing Company, whose excellent composition and presswork are worthy of mention.

We believe that we can confidently promise for 1916 the continuation of all the worthy features in the make-up of the MONTHLY, the elimination of many of its faults, and the addition of several things which will increase its interest and broaden its influence.